

What is claimed is:

1. A tissue cutting device comprising:

an outer cannula defining a tissue-receiving opening adjacent a distal end thereof;

an inner cannula slidably disposed within said outer cannula and defining a lumen from an open distal end to an open opposite proximal end, said inner cannula defining a cutting edge at said open distal end operable to sever tissue projecting through said tissue-receiving opening;

a first hydraulic rotary motor operably coupled to said inner cannula to rotate said inner cannula within said outer cannula;

a second hydraulic reciprocating motor operably coupled to said inner cannula to translate said inner cannula within said outer cannula while said inner cannula rotates; and

a hydraulic system connecting said first and second hydraulic motors to a source of pressurized fluid.

2. A tissue cutting device comprising:

an outer cannula defining a tissue-receiving opening adjacent a distal end thereof;

an inner cannula slidably disposed within said outer cannula and defining a lumen from an open distal end to an open opposite proximal end, said inner cannula further defining a cutting edge at said open distal end;

a motor assembly operably coupled to said inner cannula for rotationally and reciprocatingly driving said inner cannula within said outer cannula; and

a cutting board disposed at said distal end of said outer cannula, said cutting board formed of a resilient plastic material having a hardness less than a hardness of said inner cannula at said cutting edge but sufficient to substantially prevent permanent deformation of said cutting board under pressure from said cutting edge as said inner cannula rotates and reciprocates against said cutting board.

3. In a cannula sized for insertion in a human body, the cannula having a substantially cylindrical outer wall defining a lumen along a longitudinal axis thereof, in which the lumen is sized to receive a movable cutting member therethrough, the improvement comprising an opening defined through the outer wall communicating with the lumen, said opening having opposite edges extending substantially parallel to the longitudinal axis, each of said edges defining at least one tooth arranged to engage tissue surrounding the cannula when the cannula is inserted into a body.

4. In a cannula sized for insertion in a human body, the cannula having a substantially cylindrical outer wall defining a lumen along a longitudinal axis thereof, in which the lumen is sized to receive a movable cutting member therethrough, the outer wall defining a lateral opening therethrough communicating with the

lumen, the improvement comprising a stiffening member associated with the outer wall adjacent the lateral opening.

5. The improvement in a cannula according to claim 4, wherein said stiffening member includes a longitudinally extending rib defined in the outer wall.

6. The improvement in a cannula according to claim 5, wherein said rib is defined substantially diametrically opposite the lateral opening in the outer wall.

7. In a cannula sized for insertion in a human body, the cannula having a substantially cylindrical outer wall defining a lumen along a longitudinal axis thereof, in which the lumen is sized to receive a movable cutting member therethrough, the outer wall defining a lateral opening therethrough communicating with the lumen, the improvement comprising a dimple associated with the outer wall and projecting into the lumen adjacent the lateral opening, said dimple sized to fit between the cutting member and the outer wall when the cutting member is within the lumen.

8. The improvement in a cannula according to claim 7, wherein said dimple is formed by a crimp in the outer wall of the cannula.

9. A tissue cutting device comprising:

an outer cannula defining an outer lumen and a tissue-receiving opening adjacent a distal end of said outer cannula communicating with said outer lumen;

an inner cannula slidably disposed within said outer lumen and defining an inner lumen from an open distal end to an open opposite proximal end, said inner cannula defining a cutting edge at said open distal end operable to sever tissue projecting through said tissue-receiving opening;

a first motor operably coupled to said inner cannula to move said inner cannula in a first direction within said outer lumen;

means for supporting said first motor for movement with said inner cannula in a second direction different from said first direction; and

a second motor operably coupled to said means for supporting to move said first motor, and thereby said inner cannula, in said second direction while said first motor moves said inner cannula in said first direction.

10. A tissue cutting device comprising:

an outer cannula defining an outer lumen between a distal end and an opposite proximal end, and further defining a tissue-receiving opening adjacent said distal end communicating with said lumen;

a cutting member slidably disposed within said outer lumen,
said cutting member defining an inner lumen therethrough

between a distal end and an opposite proximal end, and further defining a cutting edge at said distal end of said cutting member;

a handpiece supporting a drive mechanism operably coupled to said cutting member to move said cutting edge across said tissue-receiving opening to sever tissue projecting therethrough;

a vacuum source in fluid communication with said proximal end of said cutting member; and

a hub having a distal end attached to said proximal end of said outer cannula, and a proximal end detachably mounted to said handpiece to permit separation of said outer cannula from said handpiece and said cutting member.

11. A tissue cutting device comprising:

an outer cannula defining an outer lumen between a distal end and an opposite proximal end, and further defining a tissue-receiving opening adjacent said distal end communicating with said lumen;

a cutting member slidably disposed within said outer lumen, said cutting member defining an inner lumen therethrough between a distal end and an opposite proximal end, and further defining a cutting edge at said distal end of said cutting member;

a handpiece supporting a drive mechanism operably coupled to said cutting member to move said cutting edge past said tissue-receiving opening to sever tissue projecting therethrough;

a vacuum source in fluid communication with said inner lumen at said proximal end of said cutting member; and

a hub having a distal end attached to said proximal end of said outer cannula, and a proximal end mounted to said handpiece, said hub defining a leak path between said outer lumen of said outer cannula and atmospheric air when said distal end of said outer cannula is disposed within a body and said hub is disposed outside the body.

12. A tissue cutting system comprising:

an outer cannula defining a tissue-receiving opening adjacent a distal end thereof;

an inner cannula slidably disposed within said outer cannula and defining a lumen from an open distal end to an open opposite proximal end, said inner cannula defining a cutting edge at said open distal end operable to sever tissue projecting through said tissue-receiving opening;

a cutting board disposed at said distal end of said outer cannula distal from said tissue-receiving opening, said cutting board configured to conform to said cutting edge for impact cutting of tissue between said cutting edge and said cutting board;

a piston disposed within a hydraulic cylinder and operably coupled to said inner cannula to move said inner cannula within said outer cannula toward said cutting board;

a return spring disposed within said cylinder and operable against said piston to move said piston in a direction away from said cutting board;

a source of pressurized fluid connected to said hydraulic cylinder having a first state providing pressurized fluid to said cylinder and a second state permitting fluid to bleed from said cylinder; and

a pressure switch coupled to said source of pressurized fluid to switch said source between said first state and said second state as a function of the magnitude of the fluid pressure within said cylinder.

13. A tissue cutting device comprising:

an outer cannula defining a tissue-receiving opening adjacent a distal end thereof;

an inner cannula slidably disposed within said outer cannula and defining a lumen from an open distal end to an open opposite proximal end, said inner cannula defining a cutting edge at said open distal end operable to sever tissue projecting through said tissue-receiving opening;

a cutting board disposed at said distal end of said outer cannula and cooperating with said cutting edge of said inner cannula to sever tissue under pressure from said cutting edge against said cutting board;

a hydraulic reciprocating motor operably coupled to said inner cannula to advance said inner cannula within said outer cannula against said cutting board; and

a hydraulic system connecting said hydraulic motor to a source of pressurized fluid to provide a substantially constant fluid pressure to said motor as said motor advances said inner cannula.

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